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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/624,357

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Aaron Scott Lukas

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AIR PRODUCTS AND CHEMICALS, INC.

PATENT DEPARTMENT

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EXAMINER

RODGERS, COLLEEN E

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/624,357	Applicant(s) LUKAS ET AL.	
	Examiner Colleen E. Rodgers	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 October 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 30,31,38,39,43,44 and 48-61 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 30,31,38,39,43,44 and 48-61 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action responds to the Amendment filed 4 October 2007. By this amendment, claims 30, 31, 38, 43, 50, 54, 57 and 61 are amended. Claims 30, 31, 38, 39, 43, 44 and 48-61 remain pending.

Claim Objections

2. Claims 50 and 57 are objected to because of the following informalities: in both claims, remove one of the duplicate instances of the compound "ditertbutylsilane" (included as both "ditertbutylsilane" and "di-tert-butylsilane"). Appropriate correction is required. This objection is repeated from the Office Action dated 4 June 2007.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 30, 31, 38, 39, 43, 44, 49, 51, 56 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ko et al** (US Patent Application Publication 2001/0055891) in view of **Li et al** (US Patent Application Publication 2003/0151031) and the article by **Waldfried et al**, "Single Wafer RapidCuringTM of Porous Low-k Materials," *IEEE*, 2002, pp. 226-228.

Regarding claim 30, **Ko et al** disclose a mixture for depositing an organosilicate film comprising a dielectric constant of 3.5 or below [see paragraph 0010], the mixture comprising at

least one structure-former precursor of an organosilane [see paragraphs 0027-0029] and a pore-former precursor that is distinct from the at least one structure-former precursor, wherein the pore-former precursor is a hydrocarbon having from 1 to 13 carbon atoms [see paragraph 0036]. **Ko et al** do not disclose wherein there are less than or equal to $2n+2$ hydrogen atoms, wherein n is the number of carbon atoms, nor wherein said film exhibits an absorbance of 200 to 400 nm wavelength.

Li et al disclose a mixture for depositing an organosilicate film with a dielectric constant lower than 3 [see paragraph 0005], which is formed by inclusion of a pore-former precursor, or poragen, wherein the poragen may be a hydrocarbon, including adamantane ($C_{10}H_{16}$, which has less than $2n+2$ hydrogen atoms) [see paragraph 0136]. It would have been obvious to one of ordinary skill in the art at the time of invention to use the poragen disclosed by **Li et al** in the mixture of **Ko et al** because **Li et al** disclose that adamantane is one of several art-recognized useful poragen materials.

Furthermore, **Ko et al** would look to one such as **Waldfried et al** for a porous low-k film, because **Waldfried et al** disclose wherein a film formed thus would exhibit an absorbance in the 200 to 400 nm wavelength range. It would have been obvious to one of ordinary skill in the art at the time of invention to modify **Ko et al** using the mixture of **Waldfried et al** because **Waldfried et al** disclose improved low-k properties and reduced process times and process temperatures [see **Waldfried et al**, Abstract].

Regarding claim 31, **Ko et al** disclose a mixture for depositing an organosilicate film, the mixture comprising: from 5 to 95% by weight of a structure-former precursor of an organosilane [see paragraphs 0027-0029] and from 5 to 95% by weight of a pore-former precursor that is distinct from the at least one structure-former precursor, wherein the pore-former precursor is a

hydrocarbon having from 1 to 13 carbon atoms [see paragraph 0036]. **Ko et al** do not disclose wherein there are less than or equal to $2n+2$ hydrogen atoms, wherein n is the number of carbon atoms, nor wherein said film exhibits an absorbance of 200 to 400 nm wavelength.

Li et al disclose a mixture for depositing an organosilicate film with a dielectric constant lower than 3 [see paragraph 0005], which is formed by inclusion of a pore-former precursor, or poragen, wherein the poragen may be a hydrocarbon, including adamantane ($C_{10}H_{16}$, which has less than $2n+2$ hydrogen atoms) [see paragraph 0136]. It would have been obvious to one of ordinary skill in the art at the time of invention to use the poragen disclosed by **Li et al** in the mixture of **Ko et al** because **Li et al** disclose that adamantane is one of several art-recognized useful poragen materials.

Furthermore, **Ko et al** would look to one such as **Waldfried et al** for a porous low-k film, because **Waldfried et al** disclose wherein a film formed thus would exhibit an absorbance in the 200 to 400 nm wavelength range. It would have been obvious to one of ordinary skill in the art at the time of invention to modify **Ko et al** using the mixture of **Waldfried et al** because **Waldfried et al** disclose improved low-k properties and reduced process times and process temperatures [see **Waldfried et al**, Abstract].

Regarding claims 38 and 43, the prior art of **Ko et al**, **Li et al** and **Waldfried et al** disclose the mixtures of claims 30 and 31, respectively, furthermore wherein the poragen is adamantane [see **Li et al**, paragraph 0136].

Regarding claims 39 and 44, the prior art of **Ko et al**, **Li et al** and **Waldfried et al** disclose the mixtures of claims 30 and 31, respectively, furthermore wherein the pore-former precursor is removable by ultraviolet radiation [see **Ko et al**, paragraph 0036].

Regarding claims 49 and 56, the prior art of **Ko et al**, **Li et al** and **Waldfried et al** disclose the mixtures of claims 30 and 31, respectively, furthermore wherein the at least one structure-former precursor comprises an organosilane [see **Ko et al**, paragraphs 0027-0029].

Regarding claims 51 and 58, the prior art of **Ko et al**, **Li et al** and **Waldfried et al** disclose the mixtures of claims 30 and 31, respectively, furthermore wherein the at least one structure-former precursor comprises an organosiloxane [see **Ko et al**, Example 5, paragraph 0055].

5. Claims 48, 50, 52-55, 57 and 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ko et al** (US Patent Application Publication 2001/0055891) in view of **Li et al** (US Patent Application Publication 2003/0151031) and the article by **Waldfried et al**, "Single Wafer RapidCuringTM of Porous Low-k Materials," *IEEE*, 2002, pp. 226-228 as applied to claim 30, 31, 38, 39, 43, 44, 49, 51, 56 and 58 above, and further in view of **Edelstein et al** (US Patent Application Publication 2005/0194619).

Regarding claims 48 and 55, the prior art of **Ko et al**, **Li et al** and **Waldfried et al** disclose the mixtures of claims 30 and 31 above. None of **Ko et al**, **Li et al** or **Waldfried et al** disclose specifically wherein the organosilicate film is represented by the formula $\text{Si}_v\text{O}_w\text{C}_x\text{H}_y\text{F}_z$, where $v+w+x+y+z = 100\%$, v is from 10 to 35 atomic%, w is from 10 to 65 atomic%, x is from 5 to 30 atomic%, y is from 10 to 50 atomic% and z is from 0 to 15 atomic%. However, **Edelstein et al** disclose a mixture for depositing an organosilicate film with a dielectric constant lower than 3 [see paragraph 0097], which is formed by inclusion of a pore-former precursor. **Edelstein et al** further discloses wherein the structure-former precursor is an organosiloxane, wherein the organosiloxane is octamethylcyclotetrasiloxane, which satisfies the atomic percentages wherein $z = 0$ atomic% [see paragraph 0086]. It would have been obvious to one of ordinary skill in the art at the time of

invention to use the structure-former precursor of **Edelstein et al** in the mixture of **Ko et al** because **Edelstein et al** disclose that the material taught therein exhibits improved cohesive strength and increased robustness [see paragraph 0002].

Regarding claims 50, 52, 53, 57, 59 and 60, the prior art of **Ko et al**, **Li et al** and **Waldfried et al** disclose the mixtures of claims 49 and 56 above, but do not disclose wherein the organosilane is selected from the list provided in claims 50 and 57. However, **Edelstein et al** disclose a mixture for depositing an organosilicate film with a dielectric constant lower than 3 [see paragraph 0097], which is formed by inclusion of a pore-former precursor. **Edelstein et al** further discloses wherein the structure-former precursor is an organosiloxane, specifically trimethylsilane, octamethylcyclotetrasiloxane or diethoxymethylsilane [see paragraphs 0066 and 0086]. It would have been obvious to one of ordinary skill in the art at the time of invention to use the structure-former precursor of **Edelstein et al** in the mixture of **Ko et al** because **Edelstein et al** disclose that the material taught therein exhibits improved cohesive strength and increased robustness [see paragraph 0002].

Regarding claims 54 and 61, the prior art of **Ko et al**, **Li et al**, **Waldfried et al** and **Edelstein et al** disclose the mixture of claims 53 and 60 as described above, furthermore wherein the hydrocarbon is adamantane [see **Li et al**, paragraph 0136].

Response to Arguments

6. Applicant's arguments filed 4 October 2007 have been fully considered but they are not persuasive. On pages 8-9 of the Remarks, Applicants allege that "the porogens [*sic*] of the Ko publication are *not* hydrocarbons *consisting of carbon and hydrogen* as recited in Applicants' claims because the disclosed porogens [*sic*] include a silicon atom" [emphasis in the original]. While

the Examiner disagrees with Applicants' overly narrow definition of "hydrocarbon" (i.e., the Examiner believes that a hydrocarbon with a substituent group containing non-hydrogen or -carbon elements is still a hydrocarbon, albeit with a substituent group), the Examiner points out that the rejection has nonetheless been changed.

On pages 9 and 10 of the Remarks, Applicants allege that "the disclosed porogens [*sic*] are also *attached* to the structure-forming component" [emphasis in the original] because **Ko et al** teach a crosslinking reaction between the components, although Applicants go on to note that "[p]aragraph [0037] of the Ko publication expressly states that the cross-linking reaction between component and the porogen [*sic*] occurs either before or during the formation of film coating." The Examiner points out that paragraph 0037 of **Ko et al** makes it clear that the two molecules, the structure-former and the pore-former, are **separate** until combined, as by **Applicants' claimed method**. The separate molecules clearly react in order to form the thin film containing pores; **Ko et al** reads on the claims in the instant case where the component and the porogen react during the formation of the film coating.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on

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the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen E. Rodgers whose telephone number is (571) 272-8603. The examiner can normally be reached on Monday through Friday, 9:00 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CER

A handwritten signature in black ink, consisting of a stylized 'T' and 'L' with a horizontal line extending to the right.

THAO X. LE
PRIMARY PATENT EXAMINER